

Features

- Enhancement mode
- Ultra low RDS(on) to minimize conduction losses
- 100% Avalanche Tested, 100% Rg Tested

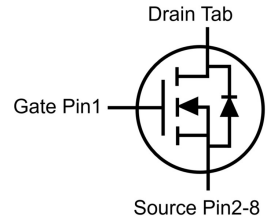
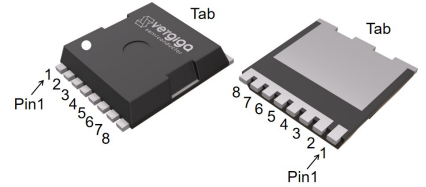
V_{DS}	40	V
$R_{DS(on),TYP@ V_{GS}=10V}$	0.85	mΩ
I_D (Wire bond Limited)	260	A



Halogen-Free

Part ID	Package Type	Marking	Packing
VS4401AKH	TOLL	4401AKH	2000PCS/Reel

TOLL



Maximum ratings, at $T_A = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		40	V
V_{GS}	Gate-Source voltage		± 25	V
I_S	Diode continuous forward current (Wire bond limited)	$T_C = 25^\circ\text{C}$	260	A
I_D	Continuous drain current @ $V_{GS}=10V$ (Wire bond limited)	$T_C = 25^\circ\text{C}$	260	A
I_D	Continuous drain current @ $V_{GS}=10V$ (Wire bond limited)	$T_C = 100^\circ\text{C}$	260	A
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	804	A
I_{DSM}	Continuous drain current @ $V_{GS}=10V$	$T_A = 25^\circ\text{C}$	39	A
		$T_A = 70^\circ\text{C}$	31	A
E_{AS}	Avalanche energy, single pulsed ②		2500	mJ
P_D	Maximum power dissipation ③	$T_C = 25^\circ\text{C}$	366	W
P_{DSM}	Maximum power dissipation ④	$T_A = 25^\circ\text{C}$	2.9	W
T_J, T_{STG}	Operating junction and storage temperature range		-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ⑤	0.34	0.41	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ⑥	36	43	$^\circ\text{C/W}$

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _j =25°C (unless otherwise stated)						
V(BR)DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(T _j =25°C)	V _{DS} =40V,V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)⑦	V _{DS} =40V,V _{GS} =0V	--	--	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±25V,V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} ,I _D =250μA	2.6	3.1	3.6	V
R _{DS(on)}	Drain-Source On-State Resistance ⑧	V _{GS} =10V, I _D =80A	--	0.85	1.1	mΩ
		(T _j =100°C) ⑦	--	1.1	--	mΩ
Dynamic Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance ⑦	V _{DS} =20V,V _{GS} =0V, f=1MHz	7570	15140	26490	pF
C _{oss}	Output Capacitance ⑦		890	1780	3120	pF
C _{rss}	Reverse Transfer Capacitance ⑦		585	1170	2045	pF
R _g	Gate Resistance	f=1MHz	0.2	1.4	2.8	Ω
Q _g	Total Gate Charge ⑦	V _{DS} =20V,I _D =80A, V _{GS} =10V	--	234	410	nC
Q _{gs}	Gate-Source Charge ⑦		--	63	110	nC
Q _{gd}	Gate-Drain Charge ⑦		--	66	116	nC
Switching Characteristics ⑦						
T _{d(on)}	Turn-on Delay Time	V _{DD} =20V, I _D =80A, R _G =3Ω, V _{GS} =10V	--	39	--	ns
T _r	Turn-on Rise Time		--	151	--	ns
T _{d(off)}	Turn-Off Delay Time		--	107	--	ns
T _f	Turn-Off Fall Time		--	77	--	ns
Source- Drain Diode Characteristics@ T _j = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =80A,V _{GS} =0V	--	0.80	1	V
T _{rr}	Reverse Recovery Time ⑦	V _{DD} =55V, I _{sd} =80A, V _{GS} =0V	--	37	74	ns
Q _{rr}	Reverse Recovery Charge ⑦	di/dt=100A/μs	--	29	58	nC

NOTE:

- ① Single pulse; pulse width ≤ 100μs.
- ② This value is based on starting T_j = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = 100A, V_{GS} = 10V; 100% FT tested at L = 0.5mH, I_{AS} = 55A.
- ③ The power dissipation P_d is based on T_j(max), using junction-to-case thermal resistance R_{θJC}.
- ④ The power dissipation P_{dsm} is based on T_j(max), using junction-to-ambient thermal resistance R_{θJA}.
- ⑤ Thermal resistance from junction to soldering point (on the exposed drain pad). These tests are performed on a cold plate.
- ⑥ These tests are performed with the device mounted on 1 in2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.
- ⑦ Guaranteed by design, not subject to production testing.
- ⑧ Pulse width ≤ 380μs; duty cycles ≤ 2%.

Typical Characteristics

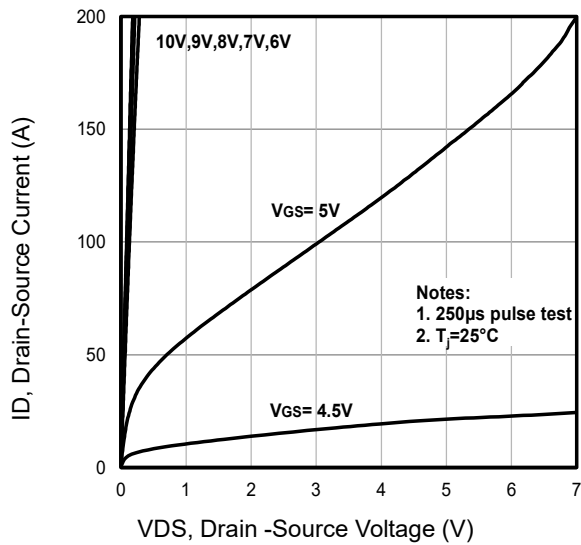


Fig1. Typical Output Characteristics

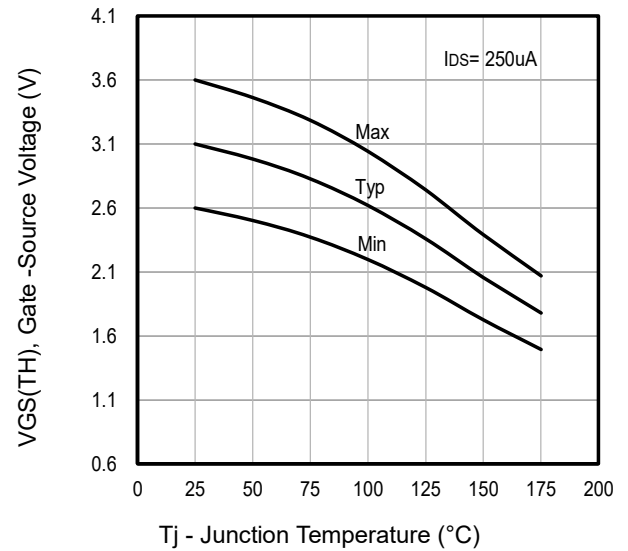


Fig2. Typical $V_{GS(TH)}$ Gate-Source Voltage Vs. T_j

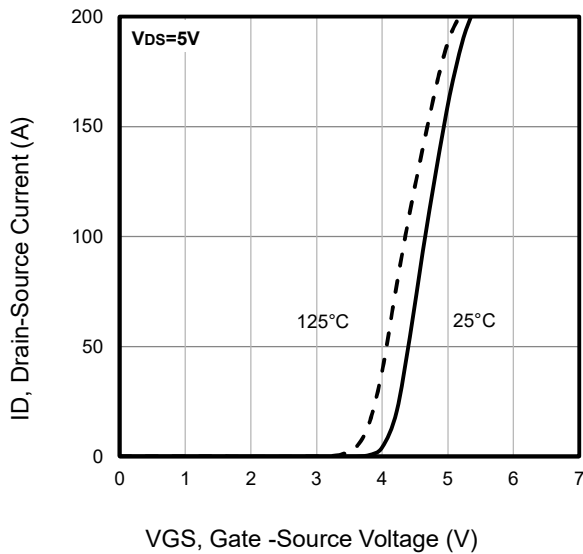


Fig3. Typical Transfer Characteristics

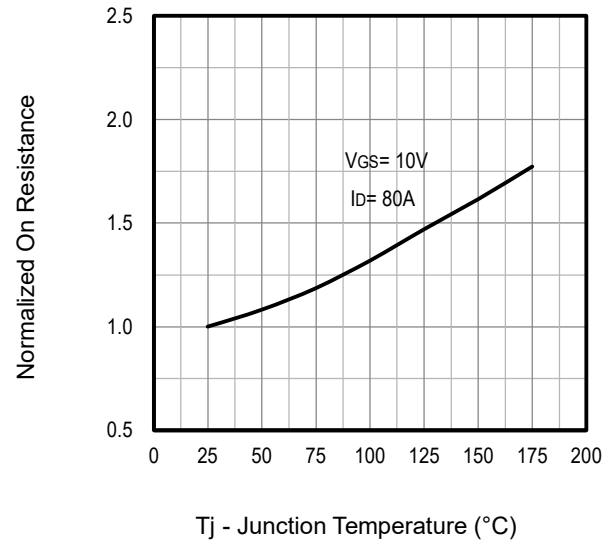


Fig4. Typical Normalized On-Resistance Vs. T_j

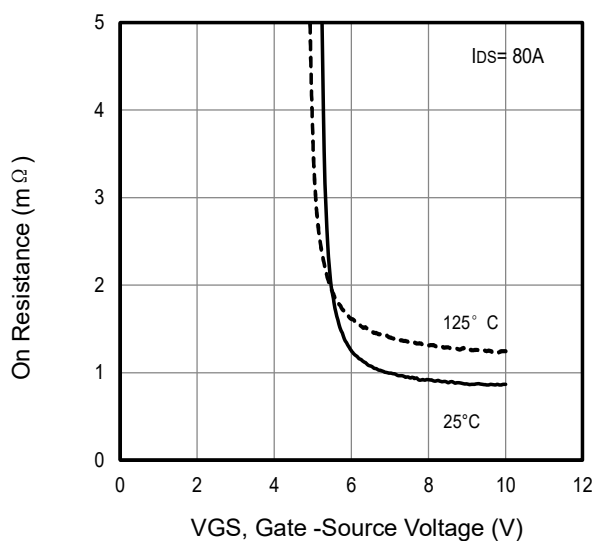


Fig5. Typical On Resistance Vs Gate-Source Voltage

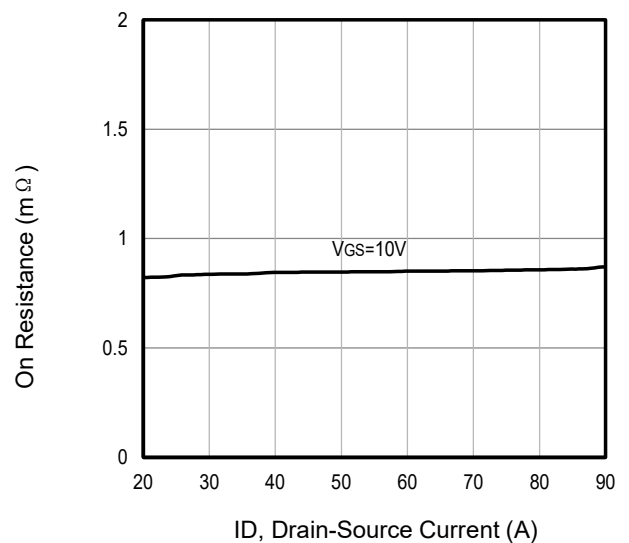


Fig6. Typical On Resistance Vs Drain Current

Typical Characteristics

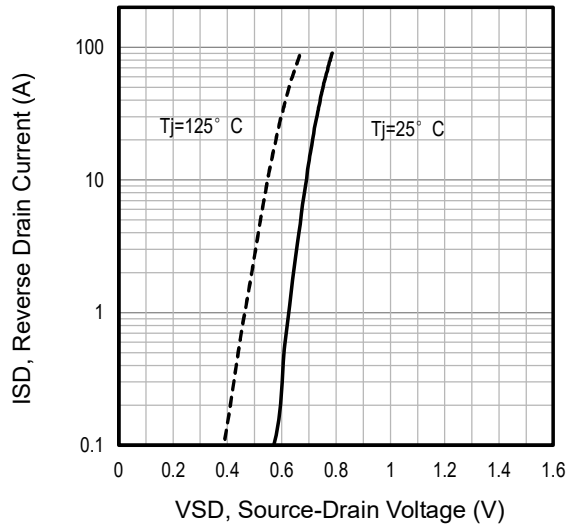


Fig7. Typical Source-Drain Diode Forward Voltage

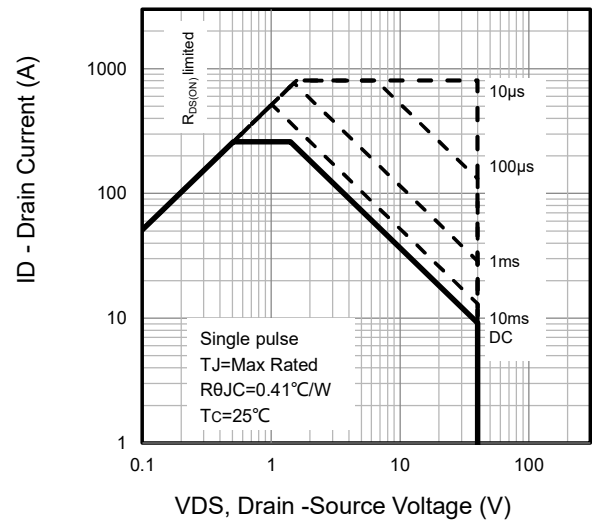


Fig8. Maximum Safe Operating Area

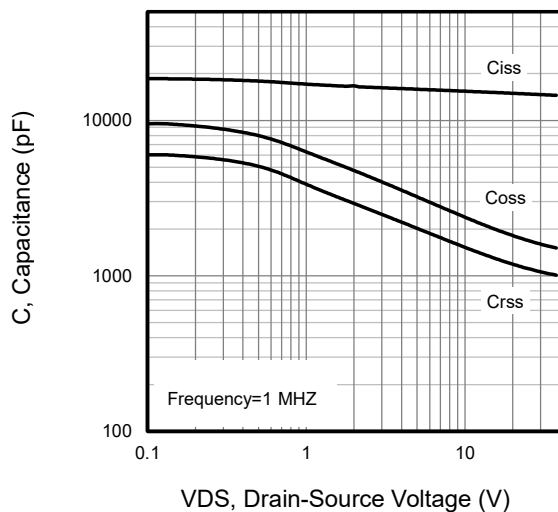


Fig9. Typical Capacitance Vs. Drain-Source Voltage

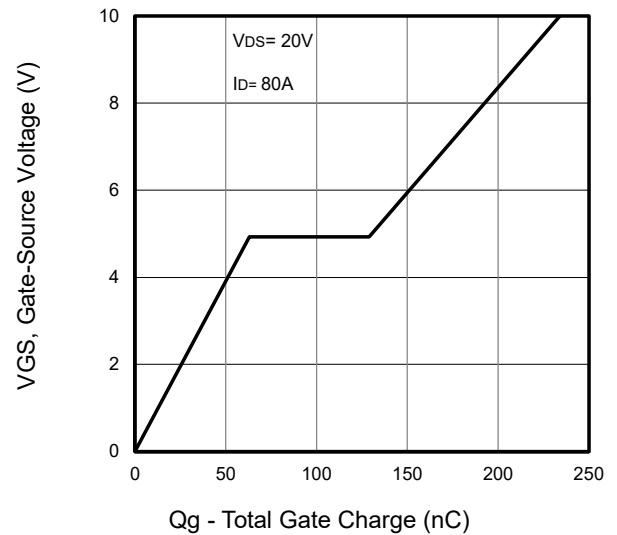


Fig10. Typical Gate Charge Vs. Gate-Source Voltage

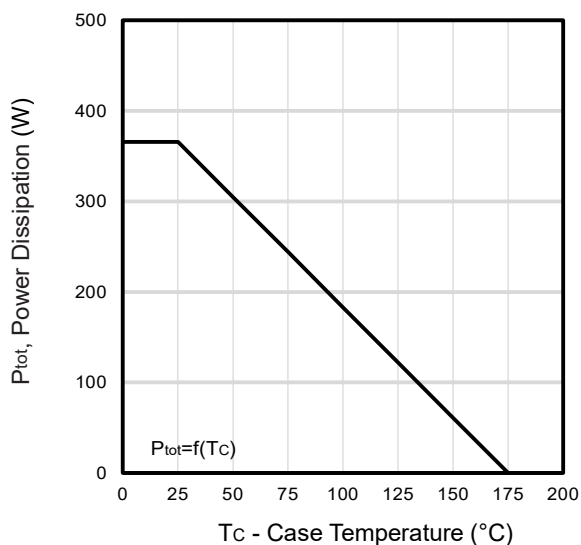


Fig11. Power Dissipation Vs. Case Temperature

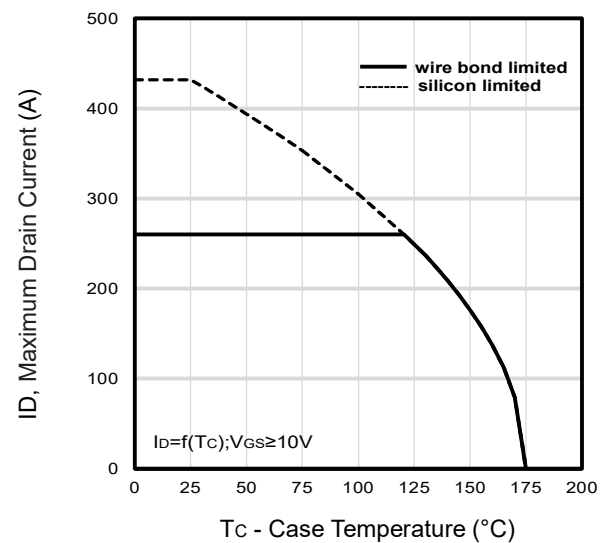


Fig12. Maximum Drain Current Vs. Case Temperature

Typical Characteristics

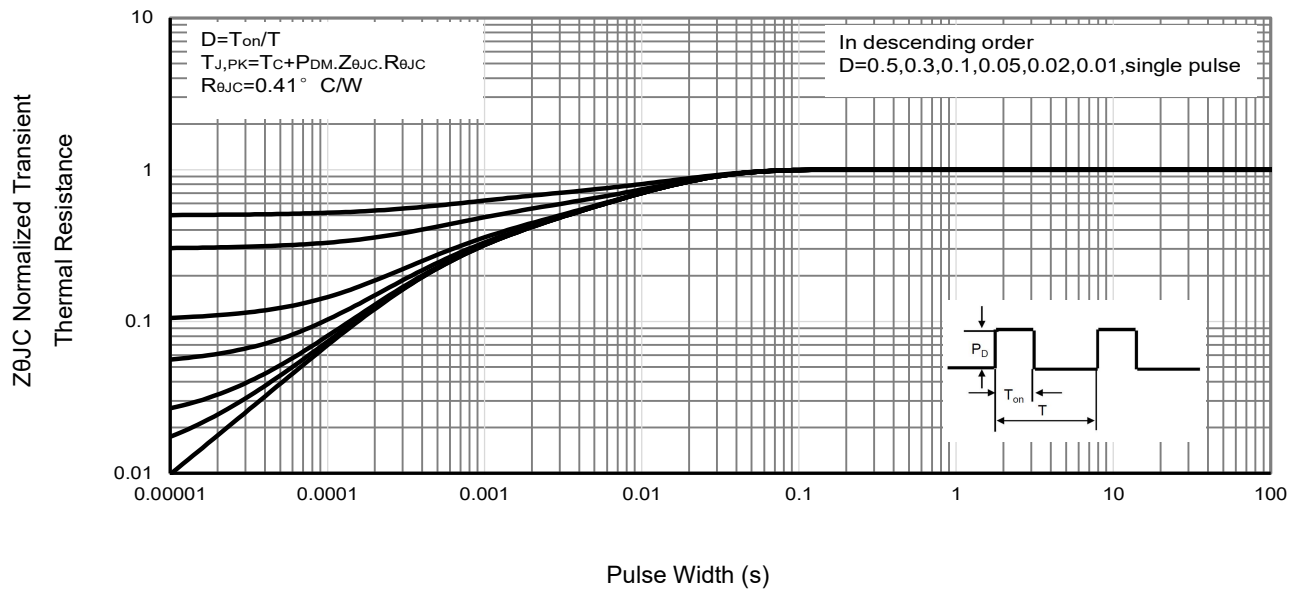


Fig13 . Normalized Maximum Transient Thermal Impedance

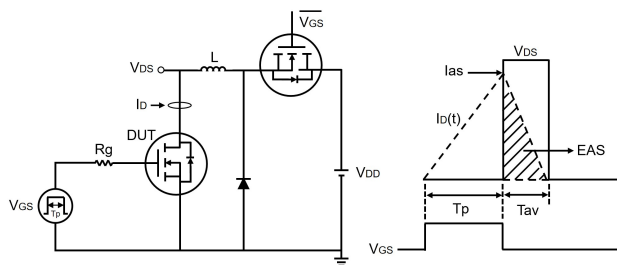


Fig14. Unclamped Inductive Test Circuit and waveforms

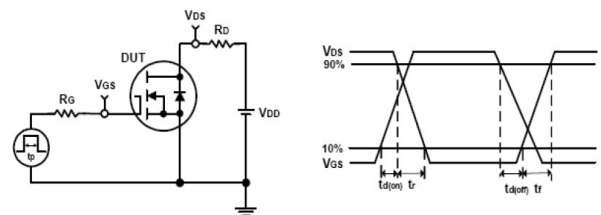
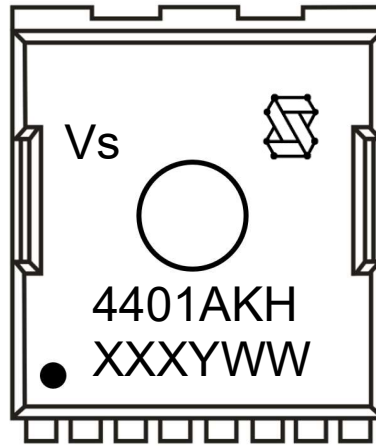


Fig15. Switching Time Test Circuit and waveforms

Marking Information



1st line: Vergiga Code (Vs), Vergiga Logo

2nd line: Part Number (4401AKH)

3rd line: Date code (XXXYWW)

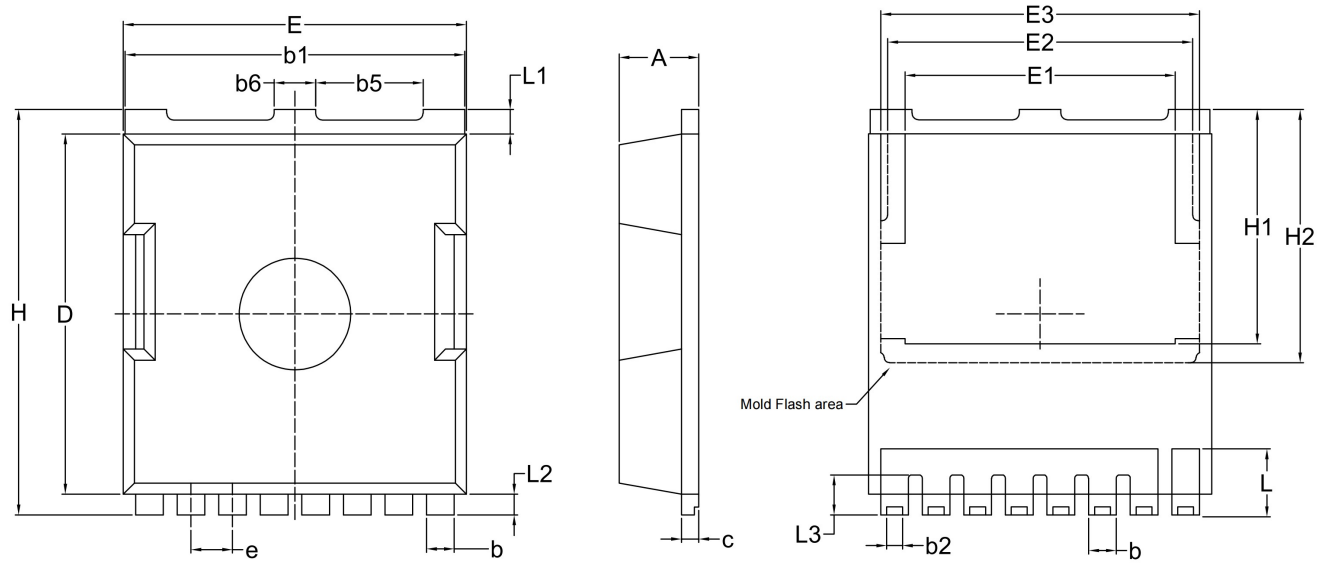
XXX: Wafer Lot Number Code , code changed with Lot Number

Y: Year Code, refer to table below

WW: Week Code (01 to 53)

Code	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

TOLL Package Outline Data(for JJ)

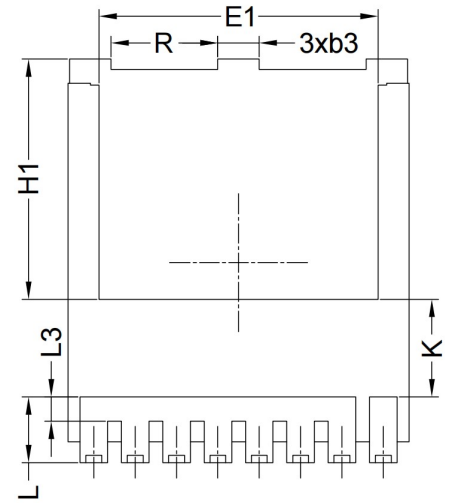
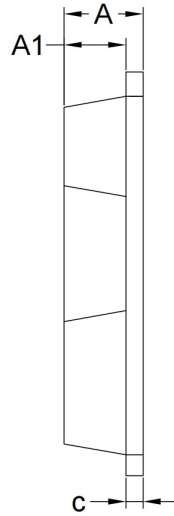
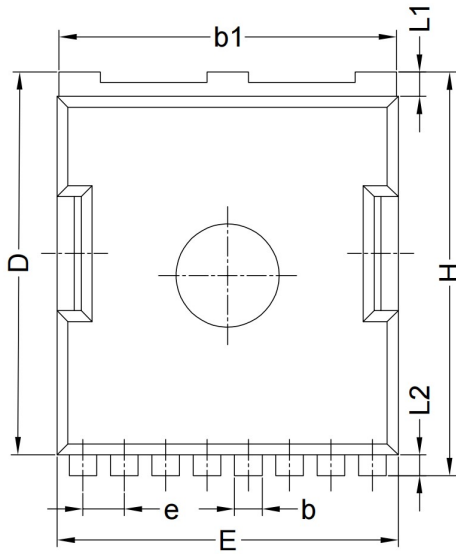


Note:

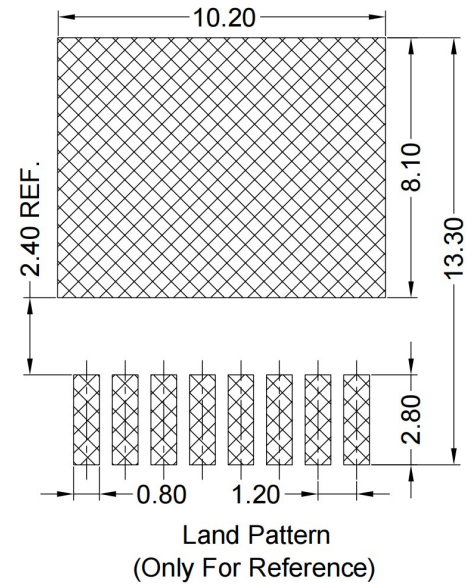
1. Dimensions do not include mold flash protrusions or gate burrs.

Symbol	DIMENSIONS (unit : mm)			Symbol	DIMENSIONS (unit : mm)		
	Min	Typ	Max		Min	Typ	Max
A	2.20	2.30	2.40	E2	--	8.80	--
b	0.70	0.80	0.90	E3	--	9.20	--
b1	9.70	9.80	9.90	e	1.20 BSC		
b2	0.42	0.46	0.50	H	11.58	11.68	11.78
b5	--	3.10	--	H1	6.65	6.75	6.85
b6	--	1.20	--	H2	--	7.30	--
c	0.492	0.500	0.508	L	1.70	1.90	2.10
D	10.28	10.38	10.48	L1	--	0.70	--
E	9.80	9.90	10.00	L2	--	0.60	--
E1	--	7.80	--	L3	1.05	1.15	1.25

TOLL Package Outline Data(for M)



Symbol	DIMENSIONS (unit : mm)		
	Min	Typ	Max
A	2.20	2.30	2.40
A1	1.70	1.80	1.90
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b3	1.10	1.20	1.30
c	0.40	0.50	0.60
D	10.28	10.38	10.48
E	9.80	9.90	10.00
E1	8.00	8.10	8.20
e	1.20BSC		
H	11.58	11.68	11.78
H1	6.95BSC		
K	2.80REF		
L	1.40	1.90	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	0.30	0.70	0.80
R	3.00	3.10	3.20



Note:

1. Dimensions do NOT include mold flash protrusions or gate burrs.